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ABSTRACT

This paper discusses the concept of geolibraries and reviews related literature. Highlights include: the opportunity of geolibraries to elevate the work of both GI (Geographical Information) scientists and librarians; geolibraries' focus on digital information and metadata, as well as the distributed nature of the libraries and collections; the lack of a culture of permanence that results from the alternative culture of the Internet; the development of the global information infrastructure; the role of libraries as participants in the learning process; workshops held in 1998 to discuss the idea of distributed geolibraries; traditional library roles in the implementation of GIS (Geographic Information Systems); revolutionary and evolutionary changes that are transforming libraries; "Internet time" as a psychological and social phenomenon; the digital divide; potential disadvantages to use of the World Wide Web as a mechanism for storing and disseminating geoinformation; the changing nature of the global economy and the demand for fast and easy access to information as the driving force behind geolibrary developments; policy challenges presented by distributed geolibraries; recommendations that would make more geospatial information available within the public domain; cost recovery, pricing, licensing, and copyright issues; demographic issues in map librarianship; the importance of standards; and collaborative relationships. (Contains 41 references.) (MES)

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Geolibraries, the Global Spatial Data Infrastructure and Digital Earth: a time for map librarians to reflect upon the Moonshot

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Much has been written about the concept of "geolibraries" from different perspectives (Goodchild, 1998, 1999, 2000; Onsrud, 1995; Buttenfield, 1998; Boxall 1998; 1999) but little has been done to actually make the case for *libraries*. This may be due, in part, to the reality that geolibraries are defined in a digital-only context. This brings us once again to the issue of how metaphors become critical, not only to our understanding of the infrastructures we attempt to build, but to the ways in which we try to link the new concepts and structures with the old. Libraries are thought of in certain ways, especially by those who use libraries but do not work in or research about libraries. One must be careful not to overstate the case that most of the research and development surrounding SDI's (including geolibraries) is being carried out by colleagues outside of the library community. This has both positive and negative effects.

On the positive side, such activity provides for potential collaboration and a new type of shared experience. From the library point of view, geographers and GI scientists who research and work on geolibraries (in all their permutations, such as digital earth) can become allies in an effort to increase access, use and preservation of cartographic materials and geospatial information. But there remains a problem area in that the ideals and beliefs held by librarians (curators and archivists as well) are not shared by geographers and GI scientists (the reverse may also be more than true). They can be shared. They have the potential to be common beliefs. However, they are not normally connected because of the differing histories of disciplines and the manner in which librarians carry out their professional and academic lives. Simply put, the emphasis in the library is on service, while the emphasis in the academic community is on research. Both communities share the roles of teaching, but even there resides a potential

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conflict. Librarians have for some time fought the intellectual battle of trying to convince academic colleagues that they too are teachers on campus. Sadly, this author has had the negative (thankfully infrequent) experience of being called a "good helper". This does not bode well for future efforts.

Those who have written about geolibraries, as well as associated issues that have always been the domain of libraries (such as access to information, archiving and preservation, and collection development), have tended to either over simplify library issues or have focused too much on the engineering and computational aspects of geolibraries. Interestingly, most people involved in GIS have assumed that metadata issues (and other standards processes related to information description) are new and unique, or even highly technical in nature. The work of ISO TC 211 and other such standards bodies, tends to involve more non-librarians. Again, this is not to detract from the positive outcomes of that work, but librarians, following the discussions on the margins, laugh among each other because they say "gee, didn't we do that a decade or two ago?".

Librarians tend to talk with, to and among librarians. Even in the broadest communal definition of librarianship and libraries, there exist divisions; such as those between librarians and curators, or archivists. So divisions and overlap between GIS and libraries should not be viewed as so odd. Why all the fuss? Simply put, there is no need to duplicate effort. Librarians can contribute to geography, and geographers to librarianship. We have common goals and experiences, and we share a common language – the spatial.

Key to this argument, of course, is the idea that map and GIS librarians are specialists among specialists, and so working collegially with other specialists in the discipline of geography makes perfect sense.

Geolibraries do provide an excellent and unique opportunity to elevate the work of both GI scientists and librarians. And there are connections to be made between geographers and GI scientists, and geographers and librarians. One thing is becoming clear, the overlap is increasing. Map libraries are becoming geospatial information centres, providing access and services; teaching and value added creation/manipulation. The level of service varies from campus to campus (speaking from the academic library, but some public libraries – especially in the US – do more than most). Everyone seems to be talking about access to information without ever thinking or mentioning libraries as being the critical juncture. This is more ironic and troubling because the concept of the library is embedded in 'geolibraries'. Goodchild defines the idea of "geolibrary" as a "library filled with georeferenced information" which is based upon the notion that information can have a geographic 'footprint' (Goodchild, 1998). He also explains that the GIS community has being working with geographic information, while georeferenced information is broader in scope to include such things as photopgraphs, videos, music and literature that can be given a locational variable which defines a footprint. In this way, the idea of the geolibrary immediately extends well beyond the traditional scope of map libraries and archives to include almost all information contained with libraries; he later mentions that it can include information outside of libraries as well. This is the theoretical basis for what we now view as geolibraires. Geolibraries are now seen as components of digital libraries, in large part due to funding of the Alexandria project which Goodchild directed. In practice however, many geolibraries are being developed based upon more limited definitions of what should be included in their "collections".

The most obvious feature of geolibaries, as is true for digital libraries, is the focus on digital information and metadata, as well as the distributed nature of the libraries and 'collections'. But they do not just include technology and information. Later, Buttenfield (1998) makes the statement that "We could (and should) discuss the technological and cognitive impediments of fully operational geolibraries. It is equally important to consider the institutional, societal, and economic issues, which have not been adequately addressed in current digital library efforts."

> Distributed geolibraries provide a useful framework for discussion of the issues of dissemination associated with the NSDI. The vision is readily extendible to a global context. (Finding # 5, Distributed Geolibraries Workshop, Mapping Science Committee, 1999).

Mike Goodchild, during his keynote at the ICA conference in Ottawa in 1999, stated that what is needed, or how we can view Digital Earth, is as a "moonshot" (Goodchild, 2000). There are others things that Goodchild et al stated which are useful and instructive to review in connection to many issues faced by map librarians who seek to become part of a move towards a 'global geolibrary infrastructure'. Many of the issues touched upon have been explored previously (Boxall, 1998; 1999; 2000), but the changes occurring in many infrastructure activities means that it is still useful to review and revamp some of the suggestions for action and reflection. Above all else, any discussion of "Digital Earth" (DE), the "Global Spatial Data Infrastructure" (GSDI), and "Distributed Geolibraries" should be framed around the broadest definitions of information and infrastructures; namely to include and focus upon the people, technology and organisations which give rise to and sustain such things.

This paper begins with an answer. At the Association of Canadian Map Libraries and Archives annual meeting in Montreal (June, 2001), I made a presentation along similar topics. During that presentation I stated that the fundamental missing piece in all this "talk" about sub-sections of the Global Information Infrastructure (GII) – GSDI being but one piece of the GII - was the lack of a "culture of permanence" which results from the alternative culture of the Internet. We have developed "near ideologies" that promote networks over people. My answer is a shift in dialogue based upon the principle that we should be funding "institutions and intellect" instead of "infrastructure and internet". This view has been called neo-luddite and reactionary. Actually, the phrase is borrowed from e-commerce, with an alteration. We hear now that total online commerce does not work well, and so we see the rise of a 'clicks and mortars' concept. I suggest that sustainable (over 100 years) Internet-based infrastructures require the type of clicks and mortar that gave rise to the greatest libraries and archives ever seen. Digital Earth is wonderful, and technically feasible, given enough resources. I want to see it happen. However, I think we have enough time to take a closer look at some of the bigger issues before we launch our moonshot – or before the vision is extended too globally.

The matters for concern are not so 'neo-luddite' after all, for even some of the strongest proponents have raised questions about some very difficult and outstanding issues. For example Goodchild mentions the connection or co-existence of two basic trends – the increasing popularity in "things geographic" and the "digital transition". From that he suggests we face a basic "paradox" in that "there is an increasing maginalization of cartography and an increasing need for good cartographic practice." I would like to borrow that phrase for a second and suggest we put in other terms in the place of cartography, such as "libraries", "archives", "education", "teachers and teaching" and "geography". And I am reminded of the fact that Kofi Annan, Secretary General of the United Nations, addressed the AAG meeting this past March, in order to remind geographers of their critical value to the greater global good. Geography is mainstream again, if it wants to be, and so also may be libraries.

And yet it is curious that most everything about DE and GSDI is written by non-librarians. Even the recently released CookBook for GSDI (www.gsdi.org) makes almost no mention of libraries, and even any mention is quaint. Perhaps it is due to the lack of involvement by librarians in GSDI? This should not be surprising when one considers that some of the great thinkers and "gurus" of this high-tech era give little attention to libraries. For example, a librarian would think that a text called the "Age of Access", dealing with information access issues, would mention libraries more than once, in one paragraph (see Rifkin, 2000, p.87). Librarians are not at the forefront of these debates. Ironic isn't it? This is the age of information, a knowledge based economy, and those most concerned with information and knowledge seem to be on the margins. This relates back again to what Goodchild stated in 1999 about the

marginalization of certain professions at the same time when they are more needed. I'll return to the issue of the "moonshot" later.

James J. Duderstadt, in Educause Jan/Feb 2001, talked about the coming GII when he said:

> We are on the threshold of a revolution that is making the world's accumulated information and knowledge accessible to individuals everywhere, a technology that will link us together in new communities never before possible or even imaginable (p.56).

This view is underlined by Borgman (2000) although the later author takes a more academic and critical view of all sides of the issue. Both authors do, however, highlight the reality that is seen in writings about geolibraries and digital earth – in fact it is seen in the process towards such things as the integration of standards at ISO. That reality is, simply put, that we are well on our way to developing the most widely used, available, fastest, and most complex (yet intuitive) communications and information distribution system ever, with an enormous amount of internationally agreed to *technical* interoperability. Notice I did not say it would be universally available or available to all equally, and I specifically place it in a technical context. This, I fear, will also be the same period of time when the division between peoples will become even greater as a result of have and have-not scenarios becoming more entrenched. The digital divide will, even under digital earth, grow! This does not mean to suggest that we should ignore progress or fail to advance technology. We can still have a moonshot, but we need to learn from our past moonshots and so-called 'revolutions'. We need to see that one technology or one revolution cannot be the saviour of us all. It can and will help, and it will also hurt too! Let us move well beyond the hype and the focus on the engineering and computational wonders.

This author would also add that libraries will always exist, and furthermore that libraries have never been more important. But this importance rests on what libraries do, and not on what they are perceived as doing. Libraries are more than storehouses (much more than 'clearinghouses'). We do more than collect and catalog. Librarians are active participants in the learning process. We are part of a great process of "change".

> In considering possible institutional arrangements for distributed geolibraries, we begin with the assumption that libraries are social institutions that will continue to change but will not be made obsolete by the advent of electronic publishing. Indeed, distributed geolibraries and digital libraries in general will complement the traditional activities of libraries and related institutions. Libraries respond to many complex societal needs. They are used for research, teaching, self-learning, and entertainment. They serve as social and activity centers for many communities, whether these be small towns, neighborhoods, or institutions. (Mapping Science Committee, 1999)

The 1998 workshops hosted by the Mapping Science Committee (under the National Academies in the US) to discuss the ideas of 'Distributed Geolibraries' was one of the few occasions where some of the best and brightest in the fields related to geoinformation (including librarians) were able to meet and review issues and possible developments. Out of that workshop came one of the few substantive reviews and presentations of geolibraries and their potential relationships to other geospatial information infrastructures. In addition to the above quotation, below are some of the more salient points raised that have a bearing on this discussion, The entire report, published and available for purchase, is also distributed by the National Academies Press via the world wide web. The report as a whole is very detailed and covers many of the issues that needed to be addressed at the time it was written (1999). However, the US-centric view in the text needs to be addressed soon if any progress is expected at an international scale. Thankfully, even the authors of the report identify this issue:

> The workshop participants were almost entirely from the United States, and this report necessarily adopts a U.S. perspective. Nevertheless it is hoped that it will be read by non-U.S. researchers and developers interested in distributed geolibraries and that it will help to achieve a greater degree of convergence in research and development at the international level (Mapping Science Committee, 1999).

Therefore, much of this essay deals with and uses examples of issues being faced outside of the digital earth "home". And although many international efforts are not thoroughly discussed, it is recognized that such things as the "Global Mapping Project" and GSDI do take into account significant barriers to access and use from an international perspective.

In 1997, the Association of Research Libraries –ARL - (Washington, D.C.) published a special issue of "Transforming Libraries" titled *Issues and Innovations in Geographic Information Systems (*ARL, 1997). While this exploration of case studies from ARL and non-ARL libraries in the US and Canada highlighted trends and services being provided within libraries, it failed to grapple with the more serious issues associated with GIS in libraries; it did mention issues, but in 1997 the move to implement GIS in libraries was still new enough that serious problems had yet to be addressed, sometimes not even recognized. However, what is most instructive is the statement regarding the value of traditional library roles:

> Though they are using GIS, libraries rarely focus on the technology itself. Sometimes there is a brief infatuation with the technology, but soon a realization sets in: though the technology is new, traditional skills of librarianship are required to use it effectively. User needs must be evaluated; data must be selected, cataloged and prepared for users; public services must be designed, offered, and managed.

The paper goes on to include a description and summary of interviews with Larry Carver and Mary Larsgaard from the University of California-Santa Barbara project for the Alexandria Digital Geospatial Library. In that section, Carver and Larsgaard make the excellent point that we have to remember that all the focus on the technology has to be geared to the basic notion of user needs which continues to be the key element of reference services in libraries.

Since the time of the ARL report, and during the whole phase of implementing GIS services within libraries, much has been written about the development of particular aspects of such services, as well as the broader issues associated with geospatial information (see: Cline and Adler, 1995; Cobb, 1995; and Smits, 1999). Also we have seen many developments associated with map library associations and calls for further cooperation, both in and outside the map library community (Boxall, 2000; Wood, 1988). But libraries and archives, especially those that work with cartographic materials and geospatial information, are more than just storehouses of media in a variety of forms; we are active learning places and long standing contributors to the economic and social vibrancy of our communities (see Hawkins, 1998).

Now that the hype and fear surrounding Y2K has passed on into the eternal ether graveyard, it should not be surprising that we find, as the dust has settled, new opportunities to really begin to find ways to extend the valuable uses of computing and telecommunications in all aspects of our work and lives. Libraries and life are being transformed by such revolutionary *and* evolutionary changes. Sadly, however, this is a time when we face a double-edged sword, or as my grandmother always warned me: be careful of what you wish for young man.

I will not argue that such change has no place. Nor does this discussion assume that the efforts by others to create more, and faster, access to geospatial information is headed in the wrong direction. On the contrary, and even beyond the hype from within our own communities, there really are great opportunities to do better things with some of the technology and data becoming available; future modelling and

dissemination methods may even extend such benefits. This paper does assume that the concepts (or metaphors) of 'geolibraries', 'digital earth' and ' spatial infrastructures' do provide the best means to get what we have always wished for, but we also must (and immediately) become more clear about the goals we wish to pursue and the problems we must overcome if we wish for our desires to be met in a sustainable, equitable and wise manner.

Frank Webster among others asks us to question what an information society is and why we continue to refer to this as an information age ("why not a computing age?") (see: Webster, 1991). How did information become some so sacred? Pehaps we need to accept the potential reality of libraries becoming extinct in order to focus on what libraries have been, are, and should become within Digital Earth. Even in the 'Distributed Geolibraries' text from the Mapping Science Committee we are presented with the blunt potential reality that…

> It is possible that libraries will be the principal means whereby citizens gain access to the services of the distributed geolibraries of the future; it is also possible that libraries *will play no significant part* in that process" (Mapping Science Committee, 1999; emphasis added).

There is time, and then there is "Internet time". Everywhere we read that the Internet has broken the stranglehold of geography; distance and time no longer matter when communications and information access can take place anytime and anywhere. However, herein Internet Time is defined as a psychological and social phenomena. It is visible in several ways, most notably the way in which "recent" ideas seem very old due to technological changes. This also relates to infrastructure issues. For example, we often have heard that the new spatial data infrastructures are being developed along similar lines as previous major transportation systems. Instead of transporting products and people via trains planes and automobiles, we are transporting ideas and information across communications networks. Ones can take hours, days, even months; the other seconds and minutes and maybe even hours. The development of past infrastructures for the transport of 'things' took decades, and is still going on today. The planning process was long and arduous. If we do not take a similar "long view" of the infrastructures of today, perhaps we may see a breakdown in the infrastructure along similar lines as we see with roads and water?

We also hear about the digital divide. This is not new. There has been for some time now (centuries or more) a real divide between "worlds" - developing and developed. Some may argue that a 'western bias' suggests the developed world is right or on the right course and should be followed. Most development theories have tried to show this as steps towards progress - an almost natural evolution of nations and peoples. Now we are being presented with a new dimension to the already existing divides - a digital divide. And here is where Internet time and infrastructure issues really become problematic. Previous infrastructures have been built around the idea of a greater public good, regardless of how much private sector involvement occurred to build the actual physical infrastructure. This, however, often led to monopolies that have been, for the most part, broken (think of phone companies). Unless a campus has a large infusion of capital to build a new fully wired and integrated digital "building", one will find that the digital infrastructure looks like a patch work of wires and screens almost thrown out into the first available space. It is as if we fear not having something, so we rush to add it no matter what the longer impact. This is one inherent problem with framing our views around legacy concepts such as infrastructures, as well as focusing on the engineering and computational facets more than the society inequities and impacts.

This is not a nostalgic trip down some false memory path suggesting in any way a return to the good old days - they don't exist. Then again, do the good new days exist? It is the *speed of change*, the Internet time equation, that is most disconcerting in relation to the building of these infrastructures (note: remember, infrastructures here include our notions of DE, GSDI and Geolibraries). The public "web" hit the market in 1990 (and then between 1990 and 1994 the WWW consortium was formed). Early 1993 NSCA released Mosaic (see: http://www.w3.org/People/Berners-Lee/ShortHistory.html). Now try finding an

advertisement without a "www" address. Some companies now only list their web site for finding information. Try the same experiment in China or Angola. We have seen similar speedy adoption of technology, along with the usual changes in formats that drive us all batty. What came before VHS? What will come after DVD? Ten years of Internet Time is too short a time to bet the future of life and work and discourse and culture.

What does all this have to do with map libraries, digital earth and SDI's? Perhaps nothing. Perhaps everything. If the Internet (the web, because only the web metaphor seems to be surviving) is only ten years old, at least from a public access point of view (even then, the reality may be that it is only five years old) then this "technology" and "infrastructure" is truly amazing and wonderful. It is consuming all of our work and discourse in ways that previous technologies have not. Perhaps that is over stating the case, but the research literature and publications in more popular press (and lists) seem to be telling us that the speed of change will only increase. Again, the 'Distributed Geolibraries" text offers a glimpse of this:

> At the same time there are potential disadvantages to use of the WWW as a mechanism for storing and disseminating geoinformation that will have to be addressed. Little of the information now available via the WWW has been subjected to the mechanisms that ensure quality in traditional publication and library acquisition: peer review, editing, and proofreading. There are no WWW equivalents of the library's collection specialists who monitor library content. But it is easy to be misled into believing that quality control problems of the WWW and distributed geolibraries are somehow different from conventional ones. Users of distributed geolibraries will tend to trust data that come from reputable institutions, with documented assurances of quality, and to mistrust data of uncertain origins, just as they do today.

The above is starting to get at some of the real critical questions, or better yet 'traditions' that seem to be evaded by some of those trying to build and gain support for certain infrastructures like DE and GSDI. There are traditions in libraries *and* archives which are as important – more so! – and should be borrowed/lent to the new infrastructures.
Libraries are, in one sense, part of the infrastructure of learning, discourse and democracy. Libraries and archives preserve and promote our heritage and culture. They are part of the communication process. They also require levels of redundancy and preservation not normally seen as valuable in a "delete and overwrite" culture which permeates the 'net'. We also hold values such as privacy, public access, neutrality, confidentiality, freedom of expression, and equality to be critical to the very nature of our work and lives. Put another way, again quoting from the "Distributed Geolibraries" workshop:

> Whereas the substantive content and focus of geographic infrastructure building have focused on data and information (e.g., the NSDI), the substantive content of traditional libraries has focused on collections of knowledge and to a lesser extent collections of information.

Jankowska and Jankowski (2000) suggest that part of the driving force behind geolibrary developments is the changing nature of the global economy and the demand for "fast and easy access to information" (p.4). They go on to state that the digital changes in libraries allow us to move beyond traditional roles and services, but ask if we will be able to fulfil our role in the digital period era (p.5). This raises a related matter that has to be with a time lag between policy and practice. Whether or not we can adapt and change to meet new roles will somewhat depend upon broader changes in the policy realm (such as with pricing of government geoinformation, a concept not fully appreciated except outside the US). Imagine if, for example, a geoinformation infrastructure was built around the idea of "mapster". Would we see similar reactions as 'Napster' received? I would also argue that some changes just taking hold are about to alter what we do and how we plan for what we do in very substantive ways; especially the coming impact of GML.

Within all these discussions and developments is the more interesting question of how we attach metaphors to what we are doing. Recall for example the hype that surrounded the "information highway". What I find curious is that metaphors are short lived; I cannot recall the last time I heard or read "information highway". Not only do we have a short technological life cycle, akin to the inverse of Moores law, but we have short life cycles with metaphors associated with the technological revolution. Why is the idea of metaphor critical? Goodchild (2000) suggested that the DE and GSDI, and Moonshot, are metaphors. I am not trying to, on purpose, be post-modern and deconstruct all these terms and concepts, nor am I trying to delve into the ontology or epistemology of these objects and ideas, but if you like that sort of thing, then enjoy.

> The metaphor of the library is powerful because it immediately suggests a number of important issues. For example, one way to think of a library is as a storehouse of the intellectual works of society, and millions of people from all walks of life have contributed works to our current library system. Can we expect to see a similar diversity of contributors in the distributed geolibraries of our future? However, the metaphor of the library should not be taken too far, and not all aspects of the operation of a library will be useful in envisioning distributed geolibraries. Many of these will be generic and of no specific relevance to the geoinformation that is the focus of distributed geolibraries ..... For example, it is assumed that distributed geolibraries will need to address issues of archiving and preservation (particularly serious issues given the rate of technological change in the digital world), but these are generic to all libraries and are not discussed at length in this report (Mapping Science Committee, 1999).

I would suggest that archiving geospatial information, mentioned above, within the context of geolibraries and/or digital earth will be "killer app".

The Mapping Science Committee report also raises issue associated with policy. However, we should be reminded that this comes from a US based view, and the policy realm outside the US is anything but uniform or stable (see especially, MADAME 2000).

> The policy challenges presented by distributed geolibraries include the following:
>
> What are the legal, ethical, and political issues involved in creating distributed geolibraries? What problems must be addressed in the area of intellectual property rights? How will these issues affect the technical development of distributed geolibraries?
>
> Who will pay for the creation and maintenance of distributed geolibraries? What components might be in the public domain versus those provided by the commercial sector? ***http://www.nap.edu/html/geolibraries/ch3.html***

The recently released "Canadian Geospatial Data Policy Study" (authored by KPMG Consulting, and funded by GeoConnections) makes some key recommendations that could have the effect, if implemented correctly and as promptly as possible, of making more geospatial information available within the public domain. One interesting point is that the study makes note of the oft quoted 1:4 ratio of economic impact generated by public release of geospatial data. This ratio is now being both questioned and discounted as "bunk". Ironically, the ration comes from a report for the Australian SDI authored by, you guessed it, KPMG (see: www.geoconnections.org for the Executive Summary). And from another vanatage point, namely Europe, we find the development of spatial information infrastructures fraught with policy barriers (see MADAME, 2000).

Can there be compromise? Is there a middle ground in cost recovery/pricing/licensing and crown copyright issues? "Branding" as opposed to copyright? Crown copyright is currently used as an

enforcement mechanism to protect revenue streams, and to impose the concept of Government IP. Certainly, all data users value the quality of data sources. We can and should comment on data quality. Canada is very fortunate to have federal agencies and institutions that produce some extremely useful and high quality data sets, not to mention "information" in general. In terms of geospatial information (over time), governments have been and continue to be the single largest producer and collector.
There may not be one "solution" that can meet all users and all requirements. However, this is not problematic because there is already a very complex situation in place. Any improvement is just that, an improvement, not matter how incremental. Also, the idea , or misconception, that the policies and implementations (agreements) in other jurisdictions like the US, Australia, or the EC, are standard and easy to implement across all communities and contingencies is wrong. There are rules, and there are always exceptions. However, the general tone of the KPMG study is one of creating a more open transmittal of data within the context of the "public good". The public good is most difficult to nail down, and it is extremely dependent upon which side of the "public fence" one resides. However, from the point of view of all parties and sides of the debate, educational uses are seen as one clear area where improvements are both easy and justifiable. Another area is the government-to-government transmittal of data.

Previously, I argued that the critical issues facing map librarianship are demographics, technology, policy and organisation (Boxall, 1999). First, in looking at demographic issues we must recognize that there have been no recent studies directly related to map librarianship, so it is necessary to infer from more general trends the possible implications for the profession. There is no doubt that, like other professions in the 'educational' sector, we are facing an aging workforce. We have seen over the last few years numerous advertisements for map and/or GIS librarianship positions that have been difficult to fill. This is not due to a lack of interested people, or persons with adequate training or experience, as much as it is due to the simple fact that the total pool of persons being trained in fields associated with map librarianship (including library and archival studies) is being courted by more lucrative employment and career opportunities. We have all come to this profession via numerous routes - and some of us are not 'librarians' but are curators or archivists or, to show how things can change, GIS Librarians. However, we must recognize that the competitive job market is having an impact.

There is another feature of demographics that we must consider. We need to be concerned and aware of the changing demographics of our clientele. This is critical when considering new types of services, or in revamping existing services and programs within our institutions. For example, we find many universities larger numbers of students drawn from non-resident populations or from groups who have, historically, been marginalized from higher education. Such groups include students whose first language is not English or students with learning disabilities. We also see trends towards more mature, continuing and distance education students. These new mosaics of students and clientele mean adapting services and collection policies to meet the needs of these clients. Add into this mix the obvious growth in the overall numbers of persons using cartographic and geographic information (in all forms) as a result of increased access to and use of digital technologies and the Internet (ie: web based mapping), and suddenly we can predict increased pressures on our resources, institutions and ourselves in the effort to meet service needs. And let us not forget, the vast majority of youth are regular users of the Internet and computing technology and their expectations for digital work and access to information are significantly different from the norm (Weil, 1999). I was recently reminded of this when my 16 month old niece showed me how to use the remote control for the TV. The generation unborn will be the one, in two to three decades, that will have expectations we have yet to even dream in Digital Earth speeches. Two to three decades in internet time is a millennium!

And what of training and professional development? Because of changes in GIS and cartography (not to mention other disciplines!), we need to make sure that our skills are up to the task. However, there is also an opportunity to become allied with a broader call for more solid educational opportunities for GIS and

cartography students and practitioners to learn from each other (Fisher, 1998). In this way, we may begin to realize that we are part of the cartographic visualization process, rather than being the 'keepers' of the output from that process (Kraak, 1998). It is not simply a matter of digital technology changing the nature of work that is of concern to our communities. In fact, digital technologies are merely the physical manifestation of changes in the culture of work. There has been a shift from the notions of public service to public entrepreneurial service. In all these professional qualification issues we need to become more aware of, and more heard among, our colleagues in related disciplines.

It is almost common knowledge that faculty, librarians, teachers, and a number of other professions are facing massive turnover in staff over the next decade. Demographers have been aware of this fact since the 1960's and 1970s when massive employment occurred in these fields. Every campus administration is trying to come to grips with the issues of faculty hiring and retention. This is true for librarians, and especially so for librarians in specialized areas such as maps, geography and GIS librarianship. 'Map Librarians" are specialists among specialists. The introduction of GIS in libraries (or is that through libraries?) has made it such that new hirings and job postings require multiple qualifications in the areas of traditional librarianship (normally attributed to the MLS) as well as a host of experiences, qualifications and training in GIS and related technologies. The demand outstrips supply (as anyone who has seen re-postings can recognize). The real issue, in relation to the development of digital earth, is where the librarians will come from in order to help shape the geolibrary component of DE (or as I like to think of it, 'who will clean up the mess').

In Canada there has been a broader study of the human resource issues jointly funded by the Geomatics Industry Association of Canada and the Canadian Institute of Geomatics, and the Canadian Association of Land Surveyors. This study on human resources (called the HAL study because of the consultants acronym) suggests that the demand from government and industry for highly qualified GIScientists and technicians will continue to grow. It also highlights the need for more training programs and new methods of delivery for professional and mid-career training. Perhaps, as was sometimes the case in the past, more GIS librarians will come from this process. Ideally, we would see many geographers take up the challenge and re-focus careers within libraries. However, libraries don't pay as well as faculty or industry positions. Which again brings up funding issues. Even Goodchild (1998) suggests that libraries are facing a difficult present and future, even without adding in human resource questions:

> At this point in history, libraries are faced with apparently insurmountable problems (Hawkins, 1996). The published corpus of humanity is growing rapidly, and doubling in not much more than ten years. Journal prices continue to rise at well above the rate of inflation. Library budgets are contracting, and libraries are faced with unprecedented problems of security. The pressures to find new approaches, and to take advantage of new technologies, are high.

At the recent Canadian Association of Geographers meeting in Montreal (June 2nd, 2001) the author made a presentation (which will be published in a forthcoming Canadian Geographer special issue on GIS) where he stated that standards are dead, but standards are more vital than ever. The developments related to XML and GML, and ISO standards related to metadata and technical issues (coming from ISO TC 211 and that committee's working groups) are merging with other developments such as the FGDC content standards and MARC21; not to mention such hybrids as Dublin Core. There is no shortage of standards in the geospatial and library communities. What is most interesting to note however is that there is a trend towards a standard with some room for local variations (to deal with such issues as pricing/access restrictions, and language).

With the Open GIS Consortium (OGC) in full-speed-ahead mode, there is little doubt that questions related to standards and interoperability are at the fore and will remain there for some time. So in that sense, standards have won the day; they are vital and critical to the continued progression towards DE and

the GSDI. But standards are not the issue we should be focused on as much as we are, even though they require some degree of greater input and advice from the library community (how many librarians are on ISO TC 211 working groups?). The potential ability to find geospatial information from distributed geolibraries is great; metadata standards will work, so long as we pick one and stick to it. The real question is: who will generate, check, load, monitor, update, and verify the metadata? Who will preserve it? Libraries can do this, but in conjunction with the other demands for services and the budgetary crises, there will be a serious backlog. Even if we can utilize consortial arrangements like OCLC or working with our individual national library networks, we will still find many serious gaps in the metadata. It is easy to contemplate the lifecycle of metadata for such items as the Digital Chart of the World, or even national topographic series from various nations.

But the above ignores the real potential in accessing geospatial information – the potential to aggregate from the local to the global – the true meaning of DE. Some libraries, mostly in the US, are developing excellent collections of data resources and metadata storehouses for local data (state as well). But DE is more than the US collections. If standards are there and (basically) agreed to, then how will we organize the collection and access of the data? Is there an agreement among the map libraries and geospatial information providers to maintain metadata (beyond some well know local cases)? Perhaps one action (to be taken immediately) would be to have the library community represented within the DE and GSDI community to develop reasonable processes to deal with the long term viability of metadata collections. Libraries and archives have a unique perspective that is not normally present in the DE and GSDI community – the long view! We deal in decades and centuries (perhaps longer). The culture of the digital geospatial community is one based upon the computing and engineering view, which tends to hold that one can re-create anything quickly, delete, overwrite, and download. This is short sighted at best. It is not to suggest that the deeds or views of those in DE and GSDI are bad, wrong, or nefarious. Rather, this is simply an expression of two cultures coming together and learning about each other. Libraries have the views of openness, neutraility, reducancy, sharing, and others, that help make sure the collections we build have some *context and lasting nature*. These views have a place within DE and GSDI, as well as within other local efforts.

Where are the data, really? Perhaps the best statement to make regarding what issues have to be overcome to have a better geolibrary network is that, in Canada, 60% of the country is mapped using 20 year old information at the 1:50,000 scale. Also, when we look at international access to local data (such as cadastral information) we find that the barriers to access and use are even greater. Not all US federal information is as easy to obtain as one would think, and the NSDI "system" is still not seamless – it is good, and it is getting closer every day. When we add in local data needs to make digital earth a reality, as well as more 'grey literature' and other non-georeferenced information, then we find the reality of digital earth is a long way off. Or is it? Perhaps efforts at new organisational structures for geospatial information will work (such as the GeoData Alliances)? Perhaps we are merely at the very beginning rather than the middle of the process? If we return to the notion of Internet time, what can we expect in ten years in terms of policy and data access? I would argue that for geolibraries to be truly effective, and for digital earth to really meet it's moonshot goal, then local data has to become the vast majority of the holdings and collections. Digital earth is going to become the ultimate metaphor for "think global, act local".

Kate Beard (1995) stated that "Engineers and librarians are two groups that one does not associate as having collaborative interests" and recognized that "fringe areas of library science" are the map librarians, and for engineering are those in spatial information engineering". From this the workshop on distributed libraries organized the meetings to
"frame the discussion by reference to the functions, services, and institutional arrangements of the library, for two major reasons: first, to engage the library community, with its long experience in providing access to information, in the development of a vision for a new kind of library and, second, to provide a familiar and concrete starting point for the discussion" (Mapping Science Committee, 1999).

Boston et al (1998) suggest that in developing new GIS-related services, it is both critical to include internal institutional or agency departments as well as a multitude of external partners who can provide support, guidance and become integral collaborators for creating new products and services. We must begin to recognise that we, under whatever banner or name, are within a specialized group. We are in essence a policy network (Coleman and Skogstad, 1990). In this case, policy does not simply refer to the creation of 'policies', but to the broader notion of socio-political associations that seek common goals – networks as communities. I would also suggest that we are part of an emerging network that has a foundation in the best of cartography, geography and librarianship. It does not mean that existing organisations or associations lose their identity. Cartographic societies remain 'cartographic', while map library associations remain 'library' associations. But we must be honest and recognize that we have too many associations and societies that are carrying out the same functions. Conversely, *because* of our small size and collegiality, we should be in a better position than most to cooperate and find new, effective means to enhance and sustain our community and our work.

Rosenblatt, S. (1999) clearly states that we "must develop new expertise and build strategic alliances and collaborative relationships with complimentary partners inside and outside" our institutions (p.45). We are facing tremendous technological change which requires inputs of money, time and energy; policy issues related to the access and use of geospatial information in all its forms requires high-level and substantial political efforts; and organisationally, we need to remove duplication of effort and find ways to coordinate actions, services, training, communication, public and political awareness and research and teaching (ie: providing the services we love!). As the move towards a Global Geospatial Data Infrastructure gains acceptance and support, our community of librarians and curators and archivists needs to be well positioned to work within that structure *and* affect its development. We cannot react to such initiatives; we must be part of their development and use. We must also be present with the power and status that comes from representing a broader community of users and creators from the library, cartography, geography and GIS communities (the geomatics community).

Clearly it behoves all associations related to these fields to sit down and openly discuss what it is they want to accomplish and how they feel they can be successful. The issues we face –demographic, policy, technological, and organisational – are such that they can only be overcome or dealt with effectively through cooperation and collaboration at levels we have yet to see. Again, many of these issues and trends to more structure and collaboration amongst communities of librarians and others is more than adequately explored by Birdsall (2000). Smits (1999) also details very nicely the new roles for our professions and adds in analysis and representations. He does make note that this requires new educational opportunities and challenges, including the financial burden on our institutions face with regard to technology and data. More importantly he clearly states that map societies must look at cooperating further. He also raises as interesting point which is of practical concern, that is, which way do we go? Do we federate with library sciences or with cartographic or geographic communities? I think the map and GIS librarians can be even more unique, we can align ourselves with both, and they with us.

The above was further stated by Goodchild when he said:

> Projects like ADL, and the concept of a geolibrary, are bridges between the GIS and library communities….. Thus we find ourselves in the GIS research community at the beginning of a period of exciting collaboration with the library and information science communities"(Goodchild 1998).

Martha Gorman, President/CEO of GITA (Geographic Information Technology Association) sent an email to the MAPS-L list on May 24th 2001 while she was at the GSDI meeting in Colombia. In that note she asked: "where are all the librarians?". Her feeling was that the issues and topics were ideally fitted to

the views and traditions of librarians. I have not as yet responded, but I think many of the issues presented here address the "why not" question. In large part it has more to do with how we have organized ourselves on the margins and less to do with what we have to contribute. We are, for better or worse, on the "front-lines" providing geospatial information services. We, even within our associations, have little in the way of resources to support the level of involvement needed or expected. We are also a small group of highly focused and specialized individuals. We need to change that if we are to be effective. And this point brings us full circle to the issue or metaphor of the Moonshot which Goodchild suggested was given to us through the call for the creation of Digital Earth (it was a moonshot speech not heard).

Moonshots like DE require focus and massive inputs of energy and human resources, not to mention cash. The original Moonshot (1963-1972) was criticized by the astronauts in the space program. In the beginning the engineers designed the spacecraft without windows and no steering mechanism – an astronaut was merely seen as cargo, along for the ride. We are again building a moonshot with an engineering and computational perspective. Those perspectives are needed and are excellent. But they do not answer all the questions, and they certainly do not look at what happens after it is built. This is a natural progression because we are enamoured with the technical possibilities, but we give short shrift to the human, organisation and socio-economic aspects. And let us face facts; in this day and age, the technology (not people) is the winner - it is 'sexy' and it is 'cool'- it is hypable!

Why all the hype why the rush? Perhaps it has to do with new technologies having a culture wrapped in Internet Time. Perhaps it has to do with forgetfulness – we forgot that sharing information is still a new idea for most of the world, while the reality is we have always lived in an information age. Digital Earth will not get off the launch pad because the concept is based upon global access to local data, and most of the planet still does not view access as a "public good" and this will exacerbate the digital divide. It is also because we feel as if we will not be able to make one more decision if we don't get this done right away, so we are tending to rush with the hope that someone will later clean up the mess. The technical aspects are meaningless because what really needs to be done right away is change focus back to the lasting things; our institutions, our culture our memory, our heritage and its relationship to the future. We need to focus the resources *within* the moonshot on institutions and intellect, and less on the infrastructure and Internet. These are revolutionary events and times, but this is not a revolution.

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